Iatrogenic myocardial dysfunction after formalization of the heart

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A 20-year-old patient with myoepicardial echinococcosis was referred to our hospital for surgical treatment. After polycystectomy had been performed, the surgical area was mistakenly washed with formaldehyde solution, and severe myocardial dysfunction ensued. Histological alterations were compatible with toxic cellular damage.

Echinococcosis is a frequent ailment in South America, Africa and other Mediterranean countries. Although the disease usually affects the hepatic and pulmonary systems, cardiac involvement is seen in a small proportion of cases. Surgery is the treatment of choice, and lavage with a parasiticide solution is recommended.

We report a case of multiple cardiac echinococcosis in which a low cardiac output developed intraoperatively as a result of myocardial edema induced by formalization of the surgical field.

Case Report

The patient, a 20-year-old woman, had been diagnosed elsewhere for cardiac echinococcosis with rupture into the pericardial space that caused

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left heart failure. She was treated with digitalis, diuretics and corticosteroids, and was referred to our hospital for definitive surgery.

On admission to our hospital, the patient's electrocardiogram showed a sinus rhythm of 90 B/min and diaphragmatic subepicardiac ischemia. Plain chest X-ray films disclosed a prominence at the level of the left atrial appendage, rounded images at the cardiac apex, and a cystic image with the fluid level in the right anterior paracardiac area. Physical findings were normal. A complete blood count showed 6,900 leukocytes/mm^3 with 13% eosinophils; results of Cassoni and Weinberg tests were positive. Hepatic and pulmonary radioisotope scans were normal, but a cardiac scan showed an area of hypoactivity in the right lower region. Echocardiography disclosed pericardial effusion and suggested cystic images. Left ventriculography revealed an anterolateral intramyocardial mass (Fig. 1). Right ventriculography showed anteroapical thickening; the contrast material did not penetrate into the right pulmonary artery. Coronary angiography showed distortion of the anterior descending artery and absence of the diagonal and obtuse marginal arteries.

The patient underwent surgery 40 hours after admission. Median sternotomy was performed, and the pericardium was opened to disclose multiple cysts (Fig. 2). After the cysts had been punctured and their contents had been aspirated, the membranes were resected one by one; the residual cavities were cleaned with pledgets soaked in 33% saline solution. At this point, the entire surgical field was mistakenly irrigated with a 10-ml solution composed of 3% formaldehyde and 1% methanol.

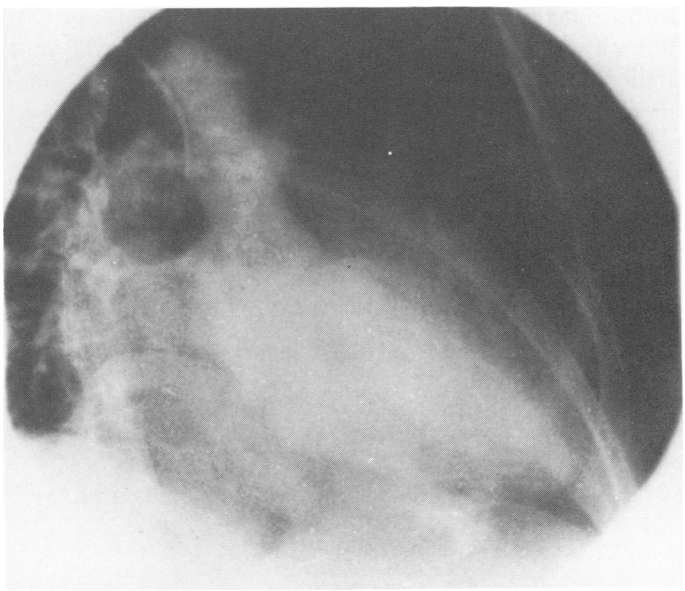

Fig. 1 Left ventriculogram showing anterolateral intramyocardial mass.

Fig. 2 Multiple cysts revealed by opening of the pericardium.

Several seconds after irrigation, the patient's hemodynamic status underwent progressive deterioration, with arterial hypotension of 70/40 mm Hg and an increase of the pulmonary capillary wedge pressure (PCWP) to 28 mm Hg. The heart appeared edematous and exhibited poor contractility, which did not improve after the administration of methylprednisolone (250 mg IV) and the infusion of dopamine (10 μg/kg/min). Emergency cardiopulmonary bypass was instituted. After 30 minutes, we attempted to interrupt cardiopulmonary bypass to administer an IV dopamine infusion, but this was not possible until an intraaortic counterpulsation balloon had been inserted.

During the immediate postoperative period, the IV dopamine infusion was continued (5 μg/kg/min), along with balloon counterpulsation. The cardiac index was 2.2 L/min/m^2, and the PCWP was 19 mm Hg. After 26 hours, when the cardiac index had risen to 2.8 L/min/m^2, the balloon was removed. The patient was extubated 32 hours after surgery, and was discharged from the intensive care unit 72 hours after surgery.

A myocardial biopsy specimen exhibited coagulation cellular necrosis due to protein precipitation, diffuse cellular edema, and fibrosis of connective tracts.

The patient has remained asymptomatic and leads a normal life.

Discussion

Rupture of an echinococcus cyst into the pericardial space is a rare event with severe consequences.[1] Surgery, which is the only effective

treatment, must be implemented as soon as possible.[2] Our usual procedure is simple polycystectomy, performed with cardiopulmonary bypass equipment in readiness. The cystic cavities and later the entire surgical field are irrigated with parasitic solution (33% aqueous solution of sodium chloride). Ordinarily, our results are satisfactory with this technique.[3]

In the case reported here, however, the surgical field was mistakenly irrigated with formaldehyde solution, and the ensuing myocardial dysfunction was severe enough to require emergency cardiopulmonary bypass and intraaortic balloon counterpulsation. The histological alterations exhibited by a biopsy specimen were compatible with toxic cell damage.

Severe irritation of the respiratory,[4] digestive,[5] and vesical mucosal[6] is well known to result from exposure to formaldehyde. Our case, which we believe to be the first of its kind, evidences severe myocardial damage after exposure to this solution.

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